WEATHER PATTERNS

Air masses

The weather in any given region at a given time is determined by the air mass over the region or by the interaction of air masses over the region. **Air masses** are extensive bodies of air that have similar temperatures and water content throughout. The source region from which they come determines their characteristics.

For example, air masses that originate over land are characterized by warm, dry air. Air masses that originate over the ocean near the equator are characterized by warm, moist air. Scientists have identified a number of different air masses and indicate them on a map with a special short hand notation that indicates both their source of origin and their temperature and moisture content.

originate at the North Pole and essentially sit over the pole. They are designated with the capital letter "A." **Polar** air masses originate in the Northern regions of the globe and can move south and are designated with the capital letter "P." **Tropical** air masses originate near the equator and can move north and are designated with the capital letter "T." Air masses that originate over continents are called **continental air masses** and they are designated with the lower case "c." Air masses that originate over the oceans are called **maritime air masses** and are designated with the lower case letter "m." So, as summarized in this graphic, an air mass that originates near the equator over the ocean is a "Maritime Tropical" air mass and is designate with the abbreviation "mT."

Lesson Checkpoint:
What are the three sources of air masses?

Weather fronts

When two air masses that have different temperature and moisture characteristics meet each other, they generally do not mix together. Instead, a boundary forms between them. At this boundary the different temperatures and moisture contents of the air masses interact. The boundary or line delineating different air masses is the **weather front**. The type of air masses that are interacting determines the characteristics of a weather front. Because weather fronts mark the interaction between dry, cool air masses and humid, warm air masses, clouds, rain and storms are the typical result. This happens because warm air is pushed higher in the atmosphere where water vapor condenses and falls as rain.

When a **cold front** moves through an area and interacts with the warm air of that region it causes storms and significant rain. In this
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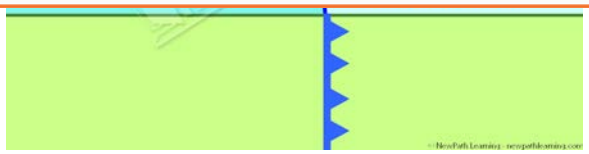

When a mass of warm air moves into a region, the warm, less dense air moves over the cool air mass and causes drizzly rain. The warm air replaces the cool air and the climate becomes warmer and more humid. Meteorologists call this a **warm front**.

When a mass of warm air moves into a region, sometimes the warm, less dense air meets the dense, cooler air and little to no movement occurs between the two air masses. The result is drizzly rain. Meteorologists call this a **stationary front**.

Storms

A small weather system that has intense energy that creates heavy rains, high winds, and lightning is called a **thunderstorm**. A thunderstorm occurs in when the atmosphere is unstable. The atmosphere is considered unstable when the air is warm and humid and is surrounded by cool, dry air. This causes the warm air to rise rapidly. The water vapor condenses into extremely large clouds. These gigantic, energy-rich clouds are called **cumulonimbus clouds.**

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kilometer every 3 seconds. To determine the observer's distance from the storm, count the number of seconds between the lightning and the sound of the thunder and divide by 3.

Thunderstorms create flash flooding due to the high volume of rain they produce, hail, extremely high winds and, sometimes, tornadoes.

Tornadoes

Tornadoes are funnels of wind rotating at very high speeds. There is a technical difference between a **funnel cloud** and a **tornado**. Technically a tornado is a funnel cloud that makes contact with the ground. When a funnel cloud makes contact with water, it is called a **waterspout.** The air pressure in the center of a tornado is extremely low.

Tornadoes begin to form when the wind direction changes from the ground upwards in the atmosphere. For example, near the ground the wind may blow from the south, but higher in the atmosphere the wind is blowing from the west. This dramatic change in wind direction with increasing altitude is known as **wind shear**. There are three varieties of wind shear: **directional shear**, **speed shear** and **speed and directional shear**. What they share in common is the fact that the direction or speed changes with altitude.

Hurricanes

A **hurricane** is an extremely large, tropical, rotating weather system that has sustained winds of at least 119 km/hr. "Hurricanes" are called **typhoons** when they form in the western Pacific Ocean, and **cyclones** when they form over the Indian Ocean.

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that the second half of the hurricane is yet to pass by: the storm is only half over.

Winter weather occurs when moisture rich air masses (that is, maritime air masses) encounter cold, polar air masses. The precipitation created falls as snow or sleet because the temperatures freeze the water in the clouds. **Snow** is crystallized water. **Sleet** is a mixture of water and ice. Sleet forms either when snow falls into warmer air and begins to melt or rain falls into colder air and begins to freeze.

Lesson Checkpoint:
Describe the typical features of a hurricane.

Predicting weather

A meteorologist is a scientist that studies and predicts weather. The ability to predict weather for a given region over a specific time period is made possible by a collection of both simple and very complex instruments.

A **barometer** is used to measure atmospheric pressure. An instrument known as an anemometer measures wind speed. Radar is an important tool for meteorologists to analyze current weather situations and to predict future weather events in a given area. Radar allows meteorologists to track the location, movement and intensity of precipitation in a region. By linking two or more radar stations, meteorologists can track precipitation over a larger region. The specific technology used is called **Doppler radar** which functions base

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Reading Weather Maps

Meteorologists use symbols to indicate weather fronts, weather systems, air pressure, wind speed and direction and more. In order to accurately read a weather map, one must first know the meaning of the symbols used.

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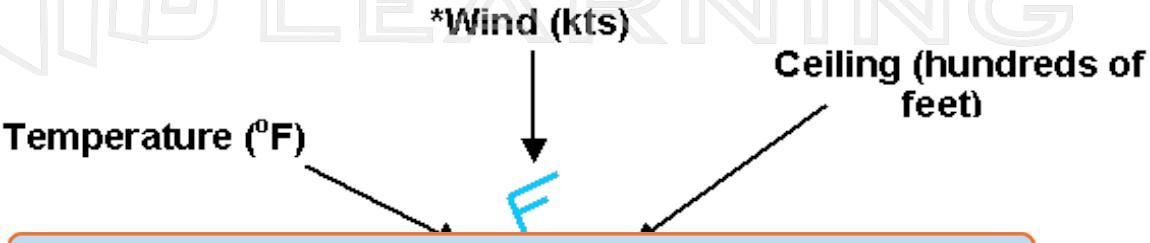
A warm front is indicated with a red line. The direction of motion on the front is indicated by a series of red semicircles that point in the direction of the front's movement. Alternating red semicircles and blue triangles that point away from one another indicates a stationary front.

Weather maps can also include lines of equal atmospheric pressure. They look like the contour lines on a geologic map. They are called **isobars**.

Weather maps usually include special symbols called **station plots**. Weather stations record the specifics of the weather at their location and indicate the details on the station plot. A station plot looks like this:



and
lines
at all) there is a circle without any flag attached. The circle represents sky cover: the amount the circle is colored in represents how cloudy the skies are. The temperature in degrees F is indicated to the left. The ceiling is how high the base of the cloud layer is from the surface. Below the temperature is a symbol describing the overall weather. (A complete list of such symbols can be found on the internet.) Below the flag is visibility recorded in miles.